

REMARKS/ARGUMENTS

The present Amendment is in response to the Office Action having a mailing date of May 1, 2006. Claims 1-30 are pending in the present Application. Applicant has amended claims 1 and 8, and claim 23 was amended to correct an informality. Applicant has also added claims 54-57. Consequently, claims 1-30 and 54-57 remain pending in the present Application.

In the above-identified Office Action, the Examiner indicated that claims 9-30 were allowed. The Examiner also indicated that claim was objected to as depending upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Applicant welcomes the Examiner's indication that claims 8-30 include allowable subject matter.

Applicant has amended claim 8 to be in independent form, incorporating the limitations of the base claim and any intervening claims. Applicant respectfully submits that claim 8 is allowable as currently presented.

Applicant has amended claim 1 to recite that the current confined layer is adjacent to both the pinned and free layers. Support for the amendment can be found in, for example, Figures 2-7 of the present application. Applicant has added claims 54-57. Claims 55-57 recite that the lateral dimension is not more than two hundred nanometers, not more than one hundred nanometers, that the thickness is not more than five nanometers, and that the depth is not more than fifty nanometers. Support for the amendment can be found in the specification, page 10, line 19-page 21, line 6. Accordingly, Applicant respectfully submits that no new matter is added.

Applicant notes that in the above-identified Office Action, the Examiner indicated that claims 31-52 were canceled. However, as claim 53 depends on canceled claim 45, Applicant presumes claim 53 has also been canceled.

In the above-identified Office Action, the Examiner rejected claims 1 and 3-6 under 35 U.S.C. § 102 as being anticipated by U.S. Patent Application Publication No. 2005/0002126 A1 (Fujiwara). In so doing, the Examiner stated that “[t]o be more specific, a spin transfer operation is nothing more than an operation that involves a current driven switching operation.”

Applicant respectfully traverses the Examiner’s rejection. Claim 1 recites a magnetic element including a pinned layer, a current confined layer, and a free layer. The current confined layer is recited as residing between the free and pinned layers and adjacent to the pinned and free layers. Because of the use of the current confined layer in conjunction with the magnetic element being capable of being switched using spin transfer, a lower current may be used. Specification, page 11, lines 16-20. Furthermore, Applicant notes that the specification states

a spin-polarized current can switch the magnetization direction of the ferromagnetic layer if the current density is sufficiently high (approximately 10^7 - 10^8 A/cm²) and the dimensions of the multilayer are small (approximately less than two hundred nanometers). In addition, for spin transfer to be able to switch the magnetization direction of a ferromagnetic layer, the ferromagnetic layer should be sufficiently thin, for instance, preferably less than approximately five nanometers for Co.

Specification, page 6, line 20-page 7, line 3. Consequently, the use of spin transfer switching requires specific maximum lengths for at least some of the dimensions of portions of the magnetic element, such as the free layer. Applicant also notes that spin transfer based switching is a fundamentally different switching mechanism than field based switching. See, specification, page 6, line 16-page 8, line 13 (e.g. page 7, lines 4-7 indicating that spin transfer may be used in addition to or in lieu of field-based switching). As such, spin transfer may not be used for magnetic elements having certain applications. For example, use of a magnetic element as a magnetoresistive sensor in a read head requires that the magnetic element be switched by the

magnetic field of the data element being read. As such, configuring a magnetic element for spin transfer may not be desirable for some applications.

In contrast, the cited portion of Fujiwara fails to teach or suggest the use of a magnetic element that includes a current confined layer between the pinned and free layers and which is configured to be switched using spin transfer. The cited portion of Fujiwara, FIG. 7, depicts a magnetic structure that includes current confined layers *within* the pinned and free layers. In particular, Fujiwara states that the layers 71 and 72 in FIG. 7 are pinned and free layers. Fujiwara, paragraph 42, first four lines (stating that the layers “71 and 72 are magnetic layer structures, either which is a free layer structure and the other is a pinned layer structure.”) Fujiwara further states that a conductive spacer layer 73 and current confined structures 74 and 74’ reside between. Fujiwara, paragraph 42, fourth line. Moreover, a single current confined layer 74 or 74’ is not adjacent to both the pinned and free layers in FIG. 7 of Fujiwara. Although the cited portion of Fujiwara does describe the use of a current confined layer in a magnetic element (within the pinned or free layers), Applicant notes that FIG. 9 of Fujiwara does depict a current confined layer that is adjacent to both pinned and free layers. However, Applicant can find no mention in Fujiwara of spin transfer based switching. As discussed above, spin transfer based switching implies particular dimensions of the magnetic element. It is not merely a mode of operation. In Fujiwara’s discussion of FIGS. 7 and 9, Applicant has found no mention of particular dimensions of the magnetic elements depicted in FIGS. 7 and 9. Consequently, the cited portion of Fujiwara fails to teach or suggest the magnetic element recited in claim 1. Accordingly, Applicant respectfully submits that claim 1 is allowable over the cited references.

Claims 3-6 and new claims 54-57 depend upon independent claim 1. Consequently, the arguments herein apply with full force to claims 3-6 and 54-57. Accordingly, Applicant respectfully submits that claims 3-6 and 54-57 are allowable over the cited references.

The Examiner also rejected claims 2 and 7 under 35 U.S.C. § 103 as being unpatentable over Fujiwara in view of U.S. Patent No. 6,865,109 (Covington).

Applicant respectfully traverses the Examiner's rejection. Claims 2 and 7 depend upon independent claim 1. Consequently, the arguments herein with respect to Fujiwara apply to claims 2 and 7.

One of ordinary skill in the art would not be motivated to add the teachings of Covington to those of Fujiwara. As discussed above, Fujiwara fails to teach or suggest a magnetic element utilizing a current confined layer that is adjacent to both the pinned and free layers in conjunction with the magnetic element being configured to allow the free layer magnetization to be switched using spin transfer. Furthermore, Fujiwara expressly states that "the present invention relates to current perpendicular-to-the-plane (CPP) spin-valve device configurations, applicable as a magnetic non-volatile mass-memory called (MRAM) *and/or as a magnetic transducer or 'head' for reading information signals recorded on a magnetic medium.*" Fujiwara, paragraph 2 (emphasis added). Thus, the magnetic element of Fujiwara should be usable for reading magnetic recording media. As such, the magnetic element of Fujiwara is configured to have its magnetization switched using an external magnetic field.

In contrast, Covington expressly states that the invention in Covington relates to magnetic memories that use a spin transfer switching mechanism. Covington, col. 1, lines 8-10. As such, the technology disclosed in Covington may not be configured for use in applications utilizing magnetic field based switching. Consequently, one of ordinary skill in the art would not be

motivated to add Covington to the teachings of Fujiwara. Applicant also notes that the analysis above with respect to Covington and Fujiwara may be applied to claims 1 and 3-6. Accordingly, Applicant respectfully submits that claims 2 and 7 are allowable over the cited references.

Applicant's attorney believes that this application is in condition for allowance. Should any unresolved issues remain, Examiner is invited to call Applicant's attorney at the telephone number indicated below.

Respectfully submitted,

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Date

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